

Tevatron Injection Helix

Yuri Alexahin

- Squeeze Sequence 13, “New-new” helix at injection.
- **150 GeV Helix studies**
- Ramp Helix studies



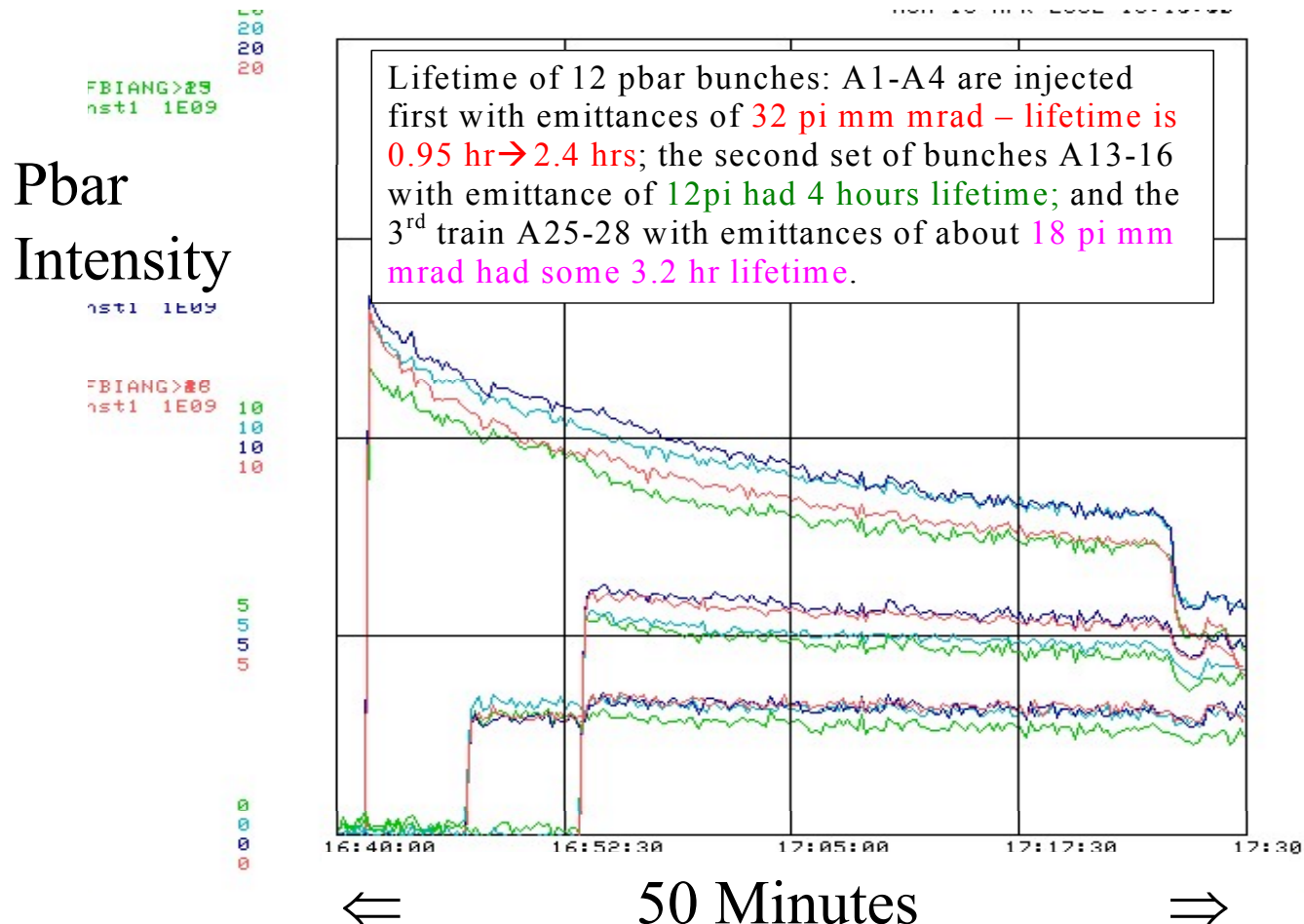
John Johnstone

- Investigating helical orbits
- New separator locations
- Momentum spread is important

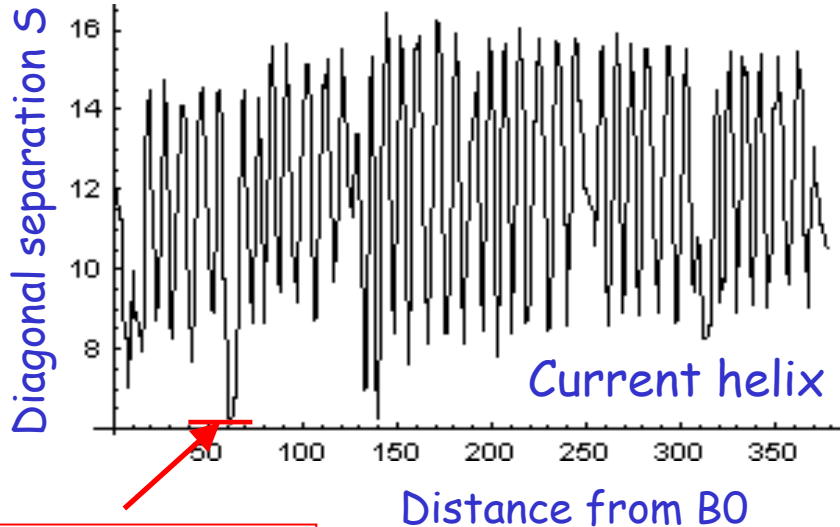
Meiqin Xiao

- Lattice modeling of the helices

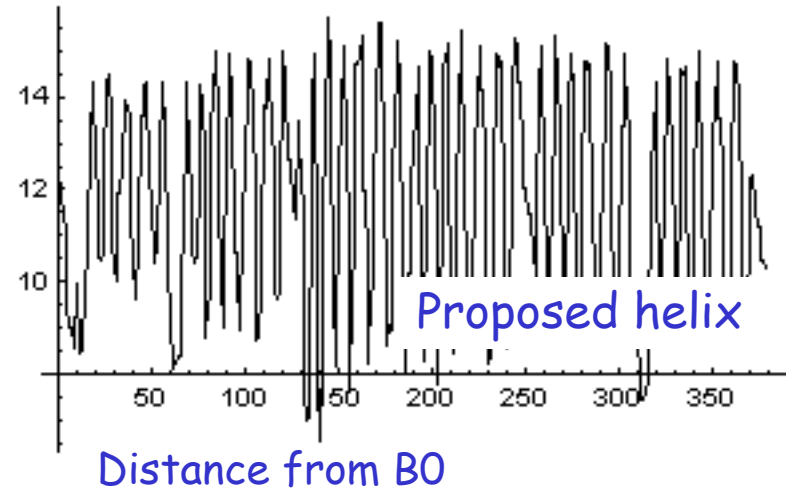
Beam-beam vs. emittance



Plan for Helix Improvement



Aperture
limitation at
C0

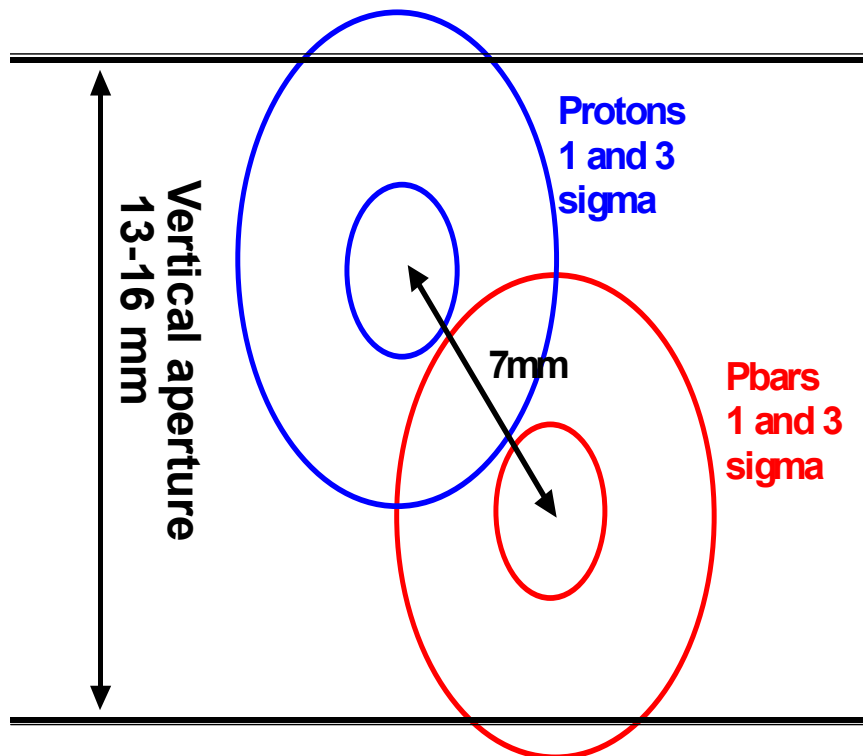


$$S = \sqrt{(\Delta x / \sigma_x)^2 + (\Delta y / \sigma_y)^2}$$

Increasing proton/pbar helix separation

- Replace C0 Lambertson with MI magnets
- Increase vertical aperture at C0 from ~15mm -> 40 mm (but only ~30% larger helix due to other aperture limitations.)
- Modify helix to increase min separation, S_{\min} , from 5.5 to 6.6

C0 Lambertson Replacement



C0 Lambertson was smallest aperture restriction.

(Jan 2003)
Replace C0 Lambertsons with MI dipole magnets.
Gain 25 mm vertically.

Vertical Aperture was doubled.

Helix Implementation Progress

Jan Shutdown:

- Replaced Lambertson
- Vertical Aperture 2X larger

Feb 19th:

- New helix was tried. Good lifetimes.
- Need to adjust feeddowns before operational.

Mar 27th: Aperture problems. (Including near F0.)

April 16th: Separators were not ramped correctly.

(April 22nd: Smoothed the orbits.)

Work left to accomplish

- 1) Is minimum separation the best criteria for designing helices? (Maybe not!)
- 2) Complete helix testing. (Orbit is important.)
- 3) Adjust feeddowns for the new helix.
- 4) Propagate helix up the ramp.

What about the lattice?

Chromaticity on the helices

Helix	Horz	Vert
Prot	11	3
Central	4	4
Pbar	3	3

Prefer to keep chromaticity at ~ 4 units with damper on for good lifetime.

Why is horizontal chromaticity so large on proton helix?

Conclusions

- C0 Lambertson replacement was successful.
- New helix was attempted.
- Attention to orbits and feeddowns needed.
- Minimum separation may not be best criteria.
- Chromaticity is factor in the lifetime
- Lattice may not be well understood.